Evaluation as a "Learning-by-Doing" Tool for the Implementation of Local Energy Efficiency Activities

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Abstract

With the "think global, act local" trends, local levels are taking an increasing role in the implementation of action plans, especially in the field of energy efficiency. An inventory of local energy efficiency operations in France confirmed a significant expansion of these activities, but also highlighted how rare their evaluation is, although a rich methodological evaluation material is available.

The research question for this study was then how to fill the gap between theory and practice. This was addressed through studying the issue of evaluation use. The first step was to find in the evaluation literature the key components of evaluation use and the success factors to overcome the barriers to evaluation practice previously identified. This was used to adjust our evaluation methods and approach, and then to apply this to a particular case study.

Key success factors for evaluation use were highlighted, such as the constructive and regular contacts between evaluators and program partners, and presenting the evaluation as a win-win collaboration.

Finally, the main evaluation use was not to quantify the results of the operation, even if it was initially the most important stakeholder expectation, but to learn how to work together, how to supervise and use an evaluation, and how to improve the operation management and the operations themselves. This way, the evaluation really appears to be a learning-by-doing tool for all stakeholders involved in the implementation of local energy efficiency activities.

Introduction

The oil crisis of the 1970s raised the need for energy conservation programs. Among other initiatives, the local level was considered relevant for implementing such programs (Gilliland and Wesley Leonard 1983). The context for local activities (local jurisdictions, energy issues awareness, etc.) can significantly differ from one country to another, and so the results will vary as well (Joerges and Müller 1983). At the Federal level, States had a priori "cultural" tendency for designing local policies (e.g., in the USA, see Dietz and Vine (1982)). But States with a more centralized organization also developed local initiatives to mobilize all motivated forces (e.g., in the United Kingdom see Sheldrick and Macgill (1988)).

This trend has widened since the Rio Conference in 1992 and the development of the general concept "thinking globally, acting locally." This has encouraged many new initiatives: for example, the International Council for Local Environmental Initiatives (ICLEI).[1] However, barriers to local energy policies still remain, as those inherent to national policy frameworks[2] (Betsill 2001b, Collier 1997). Indeed, if case studies proved local projects can deliver significant contributions to national objectives (Fleming and Webber 2004), more global reviews suggest that their effects are still limited compared to the global challenge of climate change mitigation (Betsill 2001a). Recent analyses indicate that capacity for local interventions is increasing and so are the expected results (Bulkeley and Kern 2006).

1 See www.iclei.org
2 For instance, budget constraints imposed on local authorities (e.g., separation between investments and operating budgets).

A better knowledge of local energy efficiency programs is, therefore, a key issue for both providing evidences of local contributions and building the related knowledge and skills (e.g., what works for delivering energy savings at the local level). Indeed, all stakeholders involved in energy efficiency projects face the same increasing needs: accounting for the results achieved and the use of public funds, ensuring the reliability of these results, and sharing experience feedback to improve future operations (e.g., optimizing costs and implementing and reproducing larger operations).

These expectations are the subject of evaluations. The context should thus induce more evaluation, which can be supported by the production of guidebooks or other methodological material. However, a review of local energy efficiency activities in France for 2000-2004 showed that performing evaluations was far from being systematic among local stakeholders (Broc et al. 2005).

This paper analyzes the gap between theory and practice. The issues linked to evaluation use are reviewed, and suggestions are provided for designing an evaluation methodology that focuses on integrating the evaluation in the operation process itself and on the usefulness of the evaluation outcomes. Finally, the application of this methodology is analyzed through a case study of a local promotion campaign for CFL (Compact Fluorescent Light) bulbs.

Background: the gap between theory and practice

Solid theoretical basis for the evaluation of energy efficiency programs

The evaluation of energy efficiency programs started thirty years ago. Significant experience has been acquired, specifying the issues to address (Vine, Misuriello & Hopkins 1994) and gathering information to build rich methodological materials, from the first manual (CPUC and CEC 1987) to current reference guidebooks (e.g., CPUC 2006, IPMVP 2002, SRCI 2001, Vine and Sathaye 1999, Vreuls 2005). This has resulted in developing a community of evaluation experts, with regular sharing events, such as conferences sponsored by the International Energy Program Evaluation Conference (IEPEC), the American Council for an Energy Efficient Economy (ACEEE), and the European Council for an Energy Efficient Economy (ECEEE).[3] Such a process, building a knowledge base and a profession, led to the development of evaluation systems, as shown in the exemplary case of California (Vine et al. 2006). The progress achieved so far forms a large foundation to support the realization of significant evaluation studies.

Reinforcements of the evaluation requirements for energy efficiency policies

Evaluation guidebooks (e.g., SRCI 2001 pp.8-10; Vreuls 2005 pp.4,8-10) highlight the needs and reasons for evaluating energy efficiency programs: for example, ensuring the best use of public funds. They also emphasize numerous frameworks that increase the need for evaluation, such as the Kyoto Protocol or the European Directive on Energy End-use and Energy Services (ESD 2006).

In addition, two main structural factors have led to the strengthening of the evaluation requirements for energy efficiency policies:[4] changes in the management of public policies, and the opening of the energy market with the development of new market-based instruments to support energy efficiency activities (e.g., tradable white certificates). Both changes aim at setting up systems where the objectives or obligations are related to concrete results, while in the past the focus was often on the money spent (Irrek et al. 2002). Consequently, stakeholders involved in such systems shall at least use the corresponding accounting system

3 See www.iepec.org ; www.aceee.org ; www.eceee.org

4 The contextual factor of the increasing need for climate change mitigation can also be added. But this is not an explanation of why ways of acting have changed. It is more a reason why concern about energy efficiency has increased, as energy efficiency is considered as one of the main tools for climate change mitigation.

to report their actions in order to reach their objectives or discharge their duties. In addition, they are induced to perform their own evaluations in order to improve the cost-effectiveness of their programs.

Local frameworks also progressively include evaluation requirements. But their specifications are rarely defined. For instance, an obligation of evaluation is clearly mentioned in the French *Contrats de Plan Etat-Région* (State-Region agreement framework), but no detailed evaluation guidelines or accounting systems are provided. However, local stakeholders have an interest in reporting their results to (inter)national schemes, especially to get funding and recognition in return. So, the necessity to perform evaluations also applies at the local level.

Limited use of evaluation by energy efficiency program managers and other stakeholders

Despite the availability of methodological material and the reinforcement of evaluation requirements, the practice of evaluation for local energy efficiency programs in France remains limited. When reviewing French local energy efficiency activities over the period 2000-2004, we found more than 200 initiatives, but very few examples of operations being evaluated (Broc et al. 2005). Moreover, in some of these cases, evaluation was restricted to a simple assessment including the description of the operation, its expenses and only a few elements of results (e.g., estimated number of participants).

One of the large evaluations of French public policies performed in the 1990s focused on energy efficiency policies from 1973 to 1993. Its results stressed "*the shortcoming of their monitoring and of the evaluation of their real impacts*" (Martin, Carsalade & Leteurtrois 1998 p.45). These conclusions have induced the development of tools to monitor the projects supported by the ADEME (French Environment and Energy Management Agency[5]). But the evaluation service of the Agency pointed out another issue when developing an evaluation system: the difficulties to involve all the concerned agents. Indeed, they discerned that "*the confusion between monitoring and evaluation has not totally disappeared. That's why the diffusion of an evaluation culture inside the Agency remains an orientation for future periods. The main stake is to reinforce the role of evaluation as a tool for the strategic management of programs. (…) this also requires an involvement in the management and the capitalization[6] of the recommendations deduced from evaluations*" (ADEME 2003 p.36).

These findings for national energy efficiency programs also apply for local ones, most likely even more. While reviewing French local energy efficiency activities, interviews with key actors brought out some explanations for the lack of evaluation practice (Broc 2006 p.104). First, too little means are dedicated to evaluations, especially in terms of human resources. This lack of means often results from a management culture that emphasizes the number of operations implemented and the amount of money spent, and where evaluating is perceived as a waste of time and money. And this was reinforced by the negative perception of evaluation, more often taken as a means of control rather than as a method for program improvement.

Trouslot (1995) also analyzed the barriers to the evaluation of local energy efficiency programs. He noted that evaluation should not be viewed as a technical exercise, but should be viewed as a critical analysis of the results: taking into account the different points of view among the stakeholders involved in the programs, making comparisons with other operations, and analyzing the uncertainties related to the results. Without this critical analysis, evaluation cannot play a role in decision-making and, therefore, will remain of limited use. Evaluation is then perceived either as a subjective communication tool or as an administrative burden, only made for filling up the shelves of the upper management. However, critical analysis is only possible when the data and methods used for the evaluation are of sufficient quality. Getting this quality requires a minimum level of financial and human resources dedicated to evaluation, which only

5 See www.ademe.fr

6 In this paper, we use "capitalization" when dealing with experience feedback. It includes not only the immediate use of the experience feedback, but also its accumulation (over time and between stakeholders).

occurs when the stakeholders feel involved in the evaluation process. This view can be summarized as a vicious circle (see Figure 1 below).

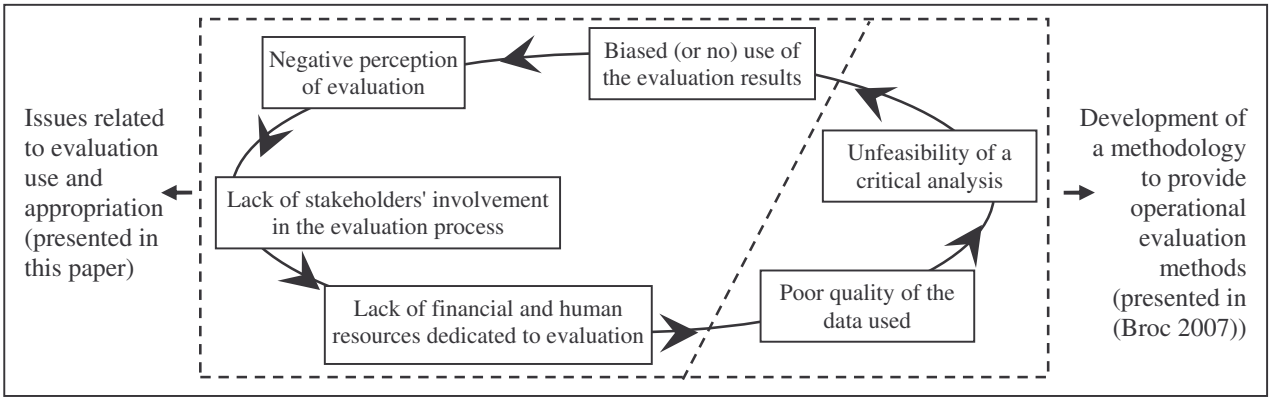

Figure 1. Vicious circle of the barriers to an effective practice of evaluation.

Based on these considerations (significant methodological material available, increasing needs of evaluating energy efficiency programs, limited evaluation practice and use at the local level), our research objectives were to look for solutions to transform the theoretical potential of evaluation into a practical evaluation culture. We developed an evaluation methodology focused on integrating the evaluation in the operation process itself and on the usefulness of the evaluation outcomes. The methodology was detailed in (Broc, Bourges & Adnot 2007). This paper first reviews the issues linked to evaluation use, and then presents a case study of the application of our methodology to a local promotion campaign for CFL.

Approach: using lessons learned from evaluation literature, to answer the needs and expectations of the stakeholders

Use of evaluation: a continuous quest

The use of evaluation is one of the main and oldest research question related to evaluation.[7] Significant works have been done in this field, sometimes raising debates (Alkin, Patton & Weiss 1990; Patton 1988; Weiss 1988). The review of these works by Shulha and Cousins (1997) is considered a key reference on this topic. But as highlighted by Weiss (1998 p.23), "*the learnings have come more from applying new constructs and perspectives than from research on evaluation use.*" Looking for correlations based on quantitative variables has failed in finding the key parameters to ensure evaluations are properly used. This is mainly due to "*how complicated the phenomenon of use is and how different situations and agencies can be from one another.*" However, very valuable lessons can be learned from experience feedback.

Weiss (1998) clarified what evaluation use is about. She introduced the distinction between four types of use, highlighting the factors favoring these uses (see Table 1 below). She also considered five subjects of use: evaluation findings; ideas and generalizations; the evaluation itself; the evaluation focus and the evaluation design. Finally she stressed the different categories of potential users: the stakeholders involved in the program; the publics targeted; the other individual users (e.g., social scientists); and the non-individual users (e.g., learning organizations).

Table 1. Distinct types of evaluation use (from Weiss 1998 pp.23-24).

7 The first paper that raised this issue is considered to be the one by Carol Weiss (Weiss 1967).

Types of use	Explanations	Factors favoring this use
Instrumental use	Use of the evaluation findings for decision making	Non controversial findings; changes proposed within the program existing frame; stability of the program environment; need for ways out of crisis or paralysis
Conceptual use	No direct change, but new ideas and insights (changes of understanding)	Involvement of the stakeholders in the evaluation process; evolutions of the organization creating favorable conditions for applying new ideas
Persuasion	Legitimating and mobilizing support for a position adopted before the evaluation	Need for change; ways of improvements already known by the program managers or operators
Enlightenment	Meta-analysis (of several studies) and/or influences beyond the area of the program evaluated	Aggregations/centralization of studies; networks or other places for experience sharing and dissemination

Weiss (1998 p.30) emphasized that "*the best way that we know to date of encouraging use of evaluation is through involving potential users in defining the study and helping to interpret results and through reporting results to them regularly while the study is in progress.*" This is favored by the participatory evaluation approach, but then evaluators have to ensure that the evaluation is not focused on what the stakeholders want in order to get satisfying results, but focused on what should be studied, as objectively as possible.

Back to the energy efficiency field, Balthasar and Rieder (2000) provide interesting results related to what can be learned from evaluations. They studied the use of the evaluations performed within the Swiss Energy 2000 program. They highlighted success factors for learning effects, relating them to each phase of an evaluation, as presented in Table 2 below.

Table 2. Success factors for learning effects (based on Balthasar and Rieder 2000).

Phase and conditions of evaluation	Related success factors for learning effects
Setting up	- Timely identification of potential users and those affected, permitting them to bring their concerns into the investigation, and reducing sources of resistance at an early stage - Formulating as precisely as possible the goals and questions of the evaluation, and defining a detailed job description and work plan (this may require a negotiation between the stakeholders) - Scheduling of the evaluation (e.g., planning in an early stage to fit decision timing)
Execution	- Building feedback circuits - Ensuring interactive procedures (e.g., organizing regular contacts, presenting evaluation findings as soon as they occur, providing interim reports)
Presentation and discussion of the results	- Formal quality (e.g., not too extensive, descriptive or theoretical) - Ensuring good diffusion (e.g., with forums)

General context of the evaluation	- Readiness of the stakeholders to cooperate with the evaluators (e.g., due to concrete expectations related to decision making) - Appearance of "windows of opportunity" (e.g., discussions for updating a regulation)

Capitalizing experience and knowledge management

The "enlightenment" type of use mentioned by Weiss (see Table 1) is favored when evaluation studies are disseminated beyond the program frontiers: beyond involved stakeholders and/or over time in the concerned organization. This is particularly true for local activities, when program operators are scattered and not always aware of what takes place in other territories. This is especially the case when a central body is organized into regional or local agencies to implement actions. Maximizing the usefulness of evaluation then refers to capitalizing experience and knowledge management. Evaluation is a key component of such approaches, because it provides information systems with significant experience feedback.

Designing evaluation methods in order to feed an evaluation system

Our analysis of evaluation use and experience capitalization found that one of the key factors for succeeding in both aspects is program managers being the heart of the evaluation process. However, for the particular field of local energy efficiency activities, these program managers may be numerous and scattered. There is, therefore, a need to centralize information. That's why our methodology is to set up an evaluation system on two levels, on-field (decentralized) and central (centralized) (see Figure 2 below). This approach of so-called "dual level evaluation" is also a way for evaluations to fit the variety and complexity of local initiatives (Allen and Black 2006).

In our case, on-field evaluation is performed by (or under the supervision of) operation managers. They are not evaluation experts and, moreover, they often get very little time to devote to evaluation. Their evaluation tools, therefore, need to be easy to appropriate and to apply. In addition, these tools need to contain further guidelines to enable going deeper into evaluation when operation managers wish so, especially in an approach of continuous improvement.

In parallel, the objectives of centralizing evaluations are: to gather and to make available information for decision-makers and operation managers; to review information ensuring evaluations' reliability and comparability; and to update evaluation methods, reference data and best practices guidebooks (for implementing operations).

This centralization may be performed either within a national body (e.g., national agency), or for a given territory (e.g., regional agency). Guidelines for centralization are meant for evaluation experts, to register information in a systematic way, and to provide structured and detailed experience feedback. These guidelines are also to be used to complete on-field evaluations, when relevant.

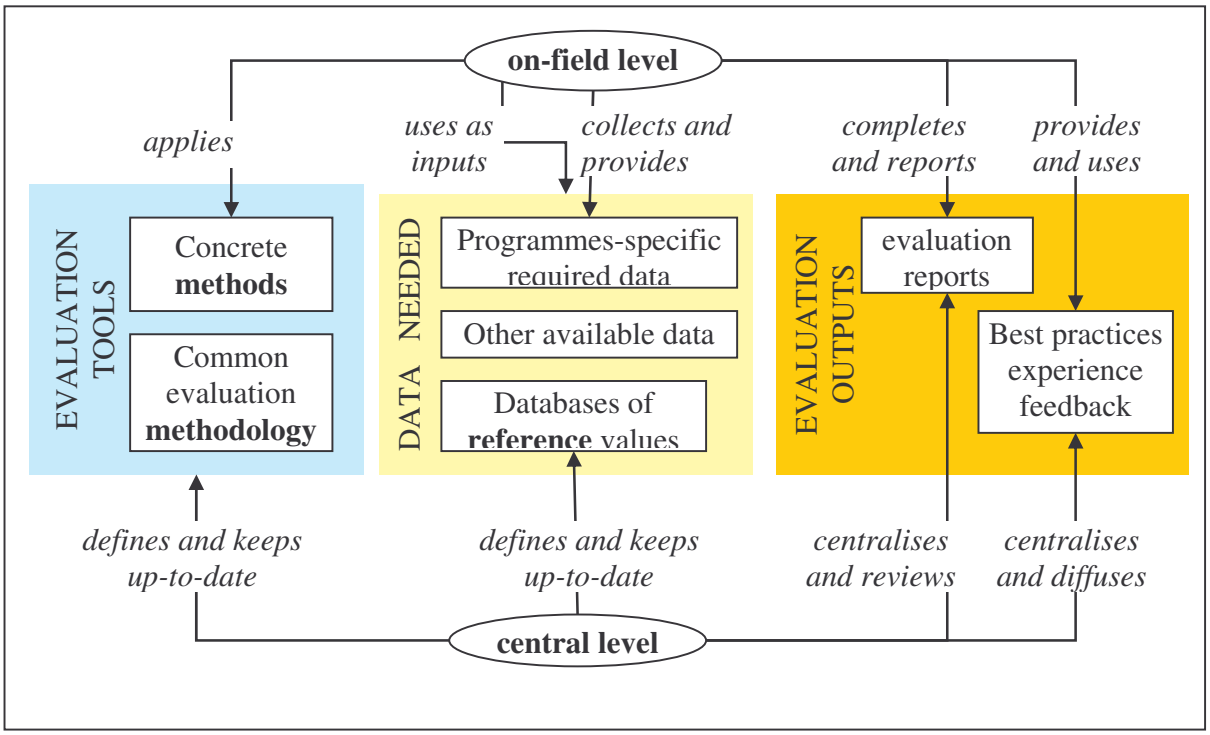

Figure 2. Evaluation system on two levels.

The evaluation methodology is also organized in a systematic way around three main evaluation fields: program theory analysis, impact evaluation and economic assessment. This structure was deduced from both a literature review and comments from stakeholders' needs and expectations. The details of the methodology, especially the key points of each evaluation field, are presented in Broc, Bourges & Adnot (2007). We present an application of this methodology to the given case of a local promotion campaign for CFLs in the residential sector.

Application: example of the evaluation of a local promotion campaign for CFLs

Summary of the case study

Context. The method was applied to a promotion campaign implemented in southeast France within the Eco Energy Plan,[8] a regional energy efficiency program developed to avoid a new electricity transmission line. The main partners were EDF[9] (leading), the ADEME, and lighting manufacturers (Philips, Osram, and GE Lighting). The campaign evaluated occurred in winter 2004.

Main outcomes and results. 63 stores took part in the operation, and they sold around 43,000 CFLs during the campaign. The net number of CFLs (taking account of free-rider and spill-over effects) was between 3,000 and 11,000 CFLs. This result has a high level of uncertainty, mainly due to a lack of ex-post data (e.g.,

8 See www.planecoenergie.org
9 Electricité de France (EDF) is the main French electricity supplier; see www.edf.fr

details of the sales data for the participating stores). Annual electricity savings were between 0.5 and 2 GWh/year (gross), and between 0.05 and 0.5 GWh/year (net). The reduction of winter peak load was calculated between 1.2 and 2.3 MW (gross) and between 0.1 and 0.5 MW (net). Using the Social Test Cost, the saved kWh was between 4 and 35 ¢/kWh (net).

Global appreciation. The partners were all satisfied by the operation, considering the results were good compared to their objectives. The success of the operation was mainly due to the close involvement of all partners, a well-targeted media strategy, and a satisfactory mobilization of the participant stores resulting from the persuasion from key partners (EDF and ADEME) and manufacturers. The results of this operation were more than twice higher than previous similar ones in France, but the contribution of the operation to the global objectives of the Eco Energy Plan remains moderate.

Lessons learned while performing the evaluation

Like Balthasar and Rieder (2000) noted (see Table 2), we could notice key issues during the different phases of the evaluation. Indeed, most of the factors for learning were fulfilled.

Setting up the evaluation. Unfortunately, but typical, the evaluation took place after the program was finished (in autumn 2005). Initial contacts with the program partners noted the constraints they were facing (limited time and money). These initial contacts provided an opportunity to clarify their expectations and objectives, and then to adjust the evaluation method. One of the main outcomes of these discussions was the idea to design a gradual method, from straightforward estimates to more sophisticated analysis. This method helps program managers to choose the most relevant level of evaluation efforts, according to the level of accuracy and details they really need (e.g., taking account of threshold values for decision making).

Collecting the data. Due to the financial constraints and the problems in evaluating a program after it was implemented, the only source for program-specific data were interviews of the partners. The partners were very cooperative, providing a clear view of the operation process and clarifying the problems in obtaining sales data. It was also a way to build a feedback circuit between the implementers and evaluators.

Analysing the data. The most useful data were not the quantitative ones, due to their high level of uncertainty. But rough estimates were sufficient to answer the stakeholders' expectations. On the other hand, the interviews were particularly interesting to draw lessons about the organization and the rules of supermarket distribution, and about partnerships involving institutional and commercial actors.

Presenting the evaluation results. Key points made at the presentation of evaluation results were to clarify the differences between gross and net results, and to highlight the explanations for the high level of uncertainty. The presentation was also used to show the interest of collecting more ex-post data and to discuss how to communicate the results and to whom. Three versions of reports were prepared: a brief summary (5 pages) for public dissemination, an intermediate report (15 pages with a one-page summary) for the partners and highlighting the main recommendations, and an exhaustive report (68 pages with a one-page summary) for research use by the EDF's Research and Development department. All versions were discussed with the partners before finalization.

General context of the evaluation. At the time of the evaluation, the EDF was conducting research on the evaluation of local energy efficiency activities, and the team of the Eco Energy Plan was looking for support about the evaluation of their operations. This situation created a synergy, ensuring both the involvement of the stakeholders in the evaluation process and windows of opportunity for an "enlightenment" type of evaluation use.

Evaluation uses for the case study

Evaluation uses are analyzed from the characteristics introduced by Weiss (1998) (see Table 1). The direct users were the operation partners, who expected the quantification of final results and recommendations. The other main users were the EDF researchers, who were interested in the concrete implementation of the evaluation methodology. In a longer term view, the EDF company could be a non-individual user through the development of its own evaluation system for local energy efficiency programs. The publics targeted were absent from the evaluation process, due to the scope of the evaluation.

Table 3 shows that the evaluation outcomes and uses for the case study were very significant for all stakeholders (program partners, EDF R&D, evaluators). Although theoretical evaluation conditions were far from being perfectly met,[10] the evaluation goes beyond what all stakeholders were expecting. The only issue is the high uncertainty for the quantitative impacts, but the evaluation clarified how uncertainties could be better managed. It thus raised the issue of the compromise between evaluation costs and accuracy.

Table 3. Analysis of evaluation uses for the case study.

(1) Outcomes for potential use	
Subject of use	**Corresponding outcomes**
Evaluation findings	Critical analysis related to the operation process and theory, to the final results and to the economic assessment; success factors and recommendations for further operations
Ideas and generalizations	Better understanding of the role of local operations in promoting efficient technologies; validation of an evaluation methodology for local activities; proposition of a dual level evaluation system
Evaluation itself	Training of the partners to main evaluation issues; raised interest in evaluation exchanges between the partners
Evaluation focus	Recognition of the importance of the program theory and process analysis, and of the need of surveys among a sample of customers and stores
Evaluation design	Adjustment of the evaluation method in order to fit stakeholders' expectations
(2) Observed uses of the evaluation	
Types of use	**Observed uses**
Instrumental use	Reproduction of the operation; communication of the results to the stores; pursuing the evaluation work (surveys among customers and stores)
Conceptual use	Better understanding between the partners; positive changes in the perception of evaluation; increasing evaluation practice
Persuasion	No initial intentions related to persuasion
Enlightenment	Application to other local energy efficiency operations (of the Eco Energy Plan area and in other regions); dissemination of the evaluation methodology and further related research works within EDF R&D

10 The problems were: the evaluation work occurred afterwards; stakeholders had time and money constraints; no specific surveys were firstly performed and the only source of ex-post data was interviewing the partners; and quantitative results could only be expressed with a high level of uncertainty.

The success in the evaluation uses can be explained by the fulfilment of the factors highlighted by Balthasar and Rieder (2000). This was achieved by focusing, from the start, the evaluation on its further uses, especially by making the stakeholders feel that the evaluation method was designed to fit their needs and expectations, and not to complete a theoretical exercice. Another key factor was to create a win-win situation for the exchange of information. We first provided reference values and benchmarking data (based on a synthesis about past local CFL promotion campaigns). It raised the interest of all stakeholders, who were then more disposed to spend time answering our interviews and to remain available during the evaluation.

Conclusions

The review of the local energy efficiency activities raised the need for evaluation and indicated a gap between theory and practice. Our research question was then how to fill this gap. This was addressed by working on the development of operational evaluation methods (see Broc, Bourges & Adnot 2007) and on the issue of evaluation use. The first step was to find in the evaluation literature what were the key components of evaluation use and the success factors to overcome the barriers to evaluation practice previously identified. This was used to adjust our evaluation methods and approach, and then to apply this to a particular case study.

Although the evaluation was not performed in perfect theoretical conditions, it provided numerous outcomes and led to significant evaluation uses. This was achieved by fulfilling the success conditions deduced from the literature and by putting the stakeholders' expectations in the center of the evaluation work. Key points were especially the constructive and regular contacts between the evaluators and the operation partners, and presenting the evaluation as a win-win collaboration: exchange of information and experiences, improving the partnership and then the results for all. We also faced some limits: restriction about information sharing (confidentiality, etc.), discussions about the fair sharing of the evaluation costs, stakeholders' time, and money constraints.

The final conclusion of this case study is that the main evaluation use was not to quantify the results of the operation, even if it was initially the most important stakeholders' expectations, but to learn how to work together, how to supervise and use an evaluation, and how to improve the operation management and the operations themselves. This way, the evaluation really appears to be a learning-by-doing tool for all stakeholders involved in the implementation of local energy efficiency activities.

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